

*Please provide the following information, and submit to the NOAA DM Plan Repository.*

**Reference to Master DM Plan (if applicable)**

*As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.*

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

**1. General Description of Data to be Managed****1.1. Name of the Data, data collection Project, or data-producing Program:**

2015 NOAA NGS Topobathy Lidar DEM: Puerto Rico

**1.2. Summary description of the data:**

These data were collected by the National Oceanic Atmospheric Administration National Geodetic Survey Remote Sensing Division using a Riegl VQ-820G system. The data were acquired from 201410- 201505 in fifty three missions. The data includes topobathy data in an LAS 1.2 format file classified as unclassified (1), ground (2), topo noise (7), water column (25), bathymetric bottom or submerged topography (26), water surface (27), submerged object (29), and International Hydrographic Organization (IHO) S-57 objects (30) in accordance with project specifications. The project consists of 525 square miles along the shores of Puerto Rico. This dataset contains 5721 - 500 m x 500 m lidar tiles.

Original contact information:

Contact Org: National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), National Geodetic Survey (NGS), Remote Sensing Division

Title: Chief, Remote Sensing Division

Phone: 301-713-2663

**1.3. Is this a one-time data collection, or an ongoing series of measurements?**

One-time data collection

**1.4. Actual or planned temporal coverage of the data:**

2014-11-02 to 2015-05-20

**1.5. Actual or planned geographic coverage of the data:**

W: -67.296377, E: -65.539127, N: 18.528369, S: 17.850323

**1.6. Type(s) of data:**

*(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)*

Map (digital)

**1.7. Data collection method(s):**

*(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)*

**1.8. If data are from a NOAA Observing System of Record, indicate name of system:**

**1.8.1. If data are from another observing system, please specify:**

**2. Point of Contact for this Data Management Plan (author or maintainer)**

**2.1. Name:**

NOAA Office for Coastal Management (NOAA/OCM)

**2.2. Title:**

Metadata Contact

**2.3. Affiliation or facility:**

NOAA Office for Coastal Management (NOAA/OCM)

**2.4. E-mail address:**

coastal.info@noaa.gov

**2.5. Phone number:**

(843) 740-1202

**3. Responsible Party for Data Management**

*Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.*

**3.1. Name:**

**3.2. Title:**

Data Steward

**4. Resources**

*Programs must identify resources within their own budget for managing the data they produce.*

**4.1. Have resources for management of these data been identified?**

**4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):**

**5. Data Lineage and Quality**

*NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality,*

*objectivity, utility, and integrity of information which it disseminates.*

### **5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible**

*(describe or provide URL of description):*

Process Steps:

- 2016-05-01 00:00:00 - Data for the Puerto Rico Topobathy lidar project was acquired by NOAA using a Riegl VQ-820G Topobathy lidar systems. All delivered lidar data is referenced to: Horizontal Datum-NAD83 (2011) epoch: 2010 Projection-UTM Zone 19 Horizontal Units-meters Vertical Datum-NAD83 (2011) epoch: 2010 (ellipsoid heights) Vertical Units-meters This dataset encompasses 5,721 500m x 500m tiles in Puerto Rico and Rhode Island. Both green lidar data and NIR lidar data (used for water surface model creation that is incorporated during refraction of the green bathymetric data) was acquired. NOAA acquired and calibrated the lidar data. Dewberry received the calibrated green and NIR data and verified complete coverage. Relative accuracy of the green swaths compared to overlapping and adjacent green swaths as well as the relative accuracy of green swaths compared to overlapping and adjacent NIR swaths was verified through the use Delta-Z (DZ) orthos created in GeoCue software. Dewberry used E-Cognition to create 2D breaklines representing land/water interfaces. These 2D breaklines were manually reviewed and adjusted where necessary to ensure all well-defined hydrographic features (at 1:1200-scale) were represented with breaklines. Using TerraScan, all green lidar data within breaklines are classified as water column and a sub-set of these points meeting specific criteria are classified as green water surface points. Using TerraScan, all NIR lidar data within breaklines are classified as water column and a sub-set of these points meeting specific criteria are classified as NIR water surface points. Dewberry used the green water surface points and NIR water surface points to create water surface models. These models are used in the refraction tool to determine the depth of bathymetric points and are created for single swaths to ensure temporal differences and wave or water surface height variations between flight lines do not impact the refraction of the bathymetric data.

Using the SBET data and the water surface models, all green lidar data classified as water column (data within the breaklines) is refracted using Dewberry's lidar Processor (DLP). Light travels at different speeds in air versus water and its direction of travel or angle is changed or refracted when entering the water column.

The refraction tool corrects for this difference by adjusting the depth (distance traveled) and horizontal position (change of angle/direction) of the green lidar data.

Using statistics and limited manual review, the output data is verified to ensure the refraction tool functioned properly. Once all green data has been refracted by flight lines, all flight lines covering each tile are combined into a single 500 m x 500 m tile. As the various flight lines may include data collected at Mean Lower Low Water (MLLW) and higher water (HW), which includes everything that is outside the range of MLLW, any HW refracted data points landward of the MLLW land/water interface were classified to class 18 to ensure these HW bathymetric points were not used when MLLW exposed ground points exist in those locations.

Dewberry used algorithms in TerraScan to create the initial ground/submerged topography surface. Dewberry then performed manual editing to review and improve the final topobathy surface. Locations of temporal differences were resolved using the Temporal Difference Decision Tree approved by NOAA. Polygons marking the locations of large temporal differences are provided as part of the deliverables. All lidar data was peer-reviewed. Dewberry's internal QC also included creating void polygons for use during review. All necessary edits were applied to the dataset. GeoCue software was used to update LAS header information, including all projection and coordinate reference system information. The final lidar data are in LAS format 1.2 and point data record format 3. The final classification scheme is as follows: 1-Unclassified 2-Ground

- 2016-05-01 00:00:00 - Dewberry made a copy of the final lidar data and transformed the ellipsoid heights into orthometric heights referenced to NAVD88 using Geoid 12B. lidar data classified as ground (2) and submerged topography (26) were then converted to ESRI multipoint format. These multipoints were then used to generate a terrain and the terrain was converted to a raster in IMG format with 1 meter pixel resolution. The terrain and output raster were created over the full project area to reduce edge-matching issues and improve seamlessness. The raster was clipped to the tile grid and named according to project specifications to result in tiled topobathymetric DEMs. All DEM deliverables will also include tiled DEMs that incorporate the use of a void layer. Void DEM dataset- The void layer was created in Global Mapper where every bathy bottom point was used to create a grid.

The distance or threshold that sets how far Global Mapper can interpolate around each bathy bottom point was set as 2. The higher the interpolation threshold, the more bathy bottom points are connected to create a continuous surface in the Global Mapper grid with fewer areas of NoData. The NoData areas in the Global Mapper grids are exported to polygons. Void polygons greater than 9 square meters are imported into Arc 10.1 Geodatabases where they are incorporated into the terrains as erase features. When the terrains are exported to raster, the void polygons used as an erase in the terrain remain as areas of NoData. A point density layer has been created and provided to NOAA as part of the deliverables. The point density layer is a raster product in IMG format with 1 meter square pixels. The density grid identifies the number of ground and/or bathy bottom points located within each pixel. The pixels in the point density layer align with the pixels in the topobathy DEMs so that the point density layer shows the density of ground/submerged topography points located in each cell that were used to determine elevations for each cell in the topobathy DEMs. Higher density lends itself to higher confidence. The point density layer can be displayed by unique values or classified into desired bins/ranges for analysis over larger areas. A confidence layer has been created and provided to NOAA as part of the deliverables. The confidence layer is a raster product in IMG format with 1 meter square pixels. The confidence layer provides a standard deviation value for every pixel by calculating the standard deviation of all ground and/or submerged topography lidar points that are located within a single pixel. The confidence layer pixels align to the pixels in the

topobathy DEMs. The confidence layer can be displayed by unique values or classified into desired bins/ranges for analysis over larger areas.

**5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:**

**5.2. Quality control procedures employed (describe or provide URL of description):**

## **6. Data Documentation**

*The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.*

**6.1. Does metadata comply with EDMC Data Documentation directive?**

No

**6.1.1. If metadata are non-existent or non-compliant, please explain:**

Missing/invalid information:

- 1.7. Data collection method(s)
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management
- 5.2. Quality control procedures employed
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location
- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

**6.2. Name of organization or facility providing metadata hosting:**

NMFS Office of Science and Technology

**6.2.1. If service is needed for metadata hosting, please indicate:**

**6.3. URL of metadata folder or data catalog, if known:**

<https://www.fisheries.noaa.gov/inport/item/48380>

**6.4. Process for producing and maintaining metadata**

*(describe or provide URL of description):*

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: [https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC\\_PD-Data\\_Documentation\\_v1.pdf](https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf)

## 7. Data Access

*NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.*

### 7.1. Do these data comply with the Data Access directive?

**7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?**

**7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:**

### 7.2. Name of organization of facility providing data access:

NOAA Office for Coastal Management (NOAA/OCM)

#### 7.2.1. If data hosting service is needed, please indicate:

#### 7.2.2. URL of data access service, if known:

<https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=6211>

[https://coast.noaa.gov/htdata/raster2/elevation/PR\\_Puerto\\_Rico\\_NGS\\_DEM\\_2015\\_6211](https://coast.noaa.gov/htdata/raster2/elevation/PR_Puerto_Rico_NGS_DEM_2015_6211)

### 7.3. Data access methods or services offered:

This data can be obtained on-line at the following URL: <https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=6211>;

### 7.4. Approximate delay between data collection and dissemination:

**7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:**

## 8. Data Preservation and Protection

*The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.*

**8.1. Actual or planned long-term data archive location:**

*(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)*

**8.1.1. If World Data Center or Other, specify:**

**8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:**

**8.2. Data storage facility prior to being sent to an archive facility (if any):**

Office for Coastal Management - Charleston, SC

**8.3. Approximate delay between data collection and submission to an archive facility:**

**8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?**

*Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection*

**9. Additional Line Office or Staff Office Questions**

*Line and Staff Offices may extend this template by inserting additional questions in this section.*